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ABSTRACT

A longitudinal study evaluated whether early remediation affected the persistence and/or performance of underprepared students at a midwestern, suburban community college. The study focused on the 3,282 students who completed the basic skills inventory in either Fall 1991 or Fall 1992. Students were classified as either prepared (N=2,028) or underprepared (N=1,254). Variables such as sex, age, number of terms attended, and cumulative grade point average were among the variables evaluated using Astin's input-environment-output model. Findings concurred with other studies of persistence and remediation in that the variables "cumulative grade point average" (GPA) and "number of remedial courses," impacted underprepared community college student persistence. Findings also suggested that early remediation, taking a remedial class within the first year, and a degree-seeking intent were also significant predictors of persistence, particularly for those students most underprepared for a college level curriculum. The variables "age," "ethnicity," "gender," and "degree-seeking intent," were significant predictors of academic performance (cumulative GPA) for underprepared college students. A model was developed which predicted 19 percent of the variance in persistence of underprepared community college students. (Contains 6 tables, 1 figure, and 25 references.) (DB)

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Assessing The Impact Of Early Remediation In The Persistence And Performance Of Underprepared Community College Students

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Jean Endo
Editor
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Assessing The Impact Of Early Remediation In The Persistence And Performance Of Underprepared Community College Students

Introduction

The nation's community colleges, along with the rest of higher education, are having to be more and more accountable to local taxpayers, state and federal agencies, as well as regional accrediting bodies. As the cost of instruction continues to rise, taxpayers are beginning to question why community colleges must use tax dollars to provide remedial instruction - instruction which should already have been completed in secondary schools (Cohen & Brawer, 1982; Lum, 1985). Significant decline in basic skills is present among all age groups as state after state has begun to institute competency tests prior to the awarding of a high school diploma (Lum, 1985). As secondary school systems continue to evaluate their models for producing better skilled graduates, increased numbers of students are appearing on the doorsteps of community colleges underprepared to be successful in a college-level curriculum. This is particularly distressing when studies show that attending a community college promotes upward social mobility in students when one compares them to persons who terminated their formal academic training with high school (Nunley & Breneman, 1988).

If access to occupational and economic success is not to be restricted according to socioeconomic status, gender, or ethnicity, then all students must have an equal opportunity to benefit from their educational experience (Astin, 1985; Pascarella and Terenzini, 1991). In order for students to benefit from their educational experience, they must persist until they have achieved their objectives - which for most individuals is degree attainment. The social and economic impacts of different levels of formal education have been discussed by Pascarella and Terenzini (1991). Studies have shown that individuals who complete a bachelor's degree have

18.3 - 46.5% more in lifetime earnings than those whose formal education ended with high school. These impacts may be especially important for individuals from disadvantaged (both economic and academic) backgrounds. Terenzini et al. (1994) points out that denying these students the opportunities not only to attend but to also succeed in college, closes the door on potential social and economic multiplier effects that college completion may produce.

Student Persistence

Many researchers have discussed and developed models on student attrition/persistence in higher education (see Tinto, 1982; Bean, 1986; Bean and Metzner, 1985; Pascarella and Chapman, 1983; Astin, 1984). Tinto (1982) pointed out that persistence rates in higher education have remained strikingly constant over the last 100 years. His model on student dropout 'highlighted the complex manner in which social interactions within the formal and informal academic and social systems of the institution impinge upon the student dropout'. In Bean's (1986) discussion of retention models, he pointed out that students interact with a college bureaucratically or organizationally, as well as academically and socially while environmental factors concurrently act as a force that can pull students away from school. Bean and Metzner (1985) in their nontraditional student attrition model postulated that four sets of variables explain student dropout decisions: academic performance; intent to leave (influenced primarily by psychological issues but also by academic variables); background and defining variables (primarily high school performance and educational goals); and environmental variables (finances, family responsibilities, work hours, etc.). However, many of these authors point out the need for further research on group-specific models on persistence which may have important

policy implications. Studies of dropout incidence, and therefore persistence, among specific groups of students, especially among disadvantaged, may aid in the development of institutional and/or system policies designed to assist particular subpopulations of students (Tinto, 1982).

One of these disadvantaged subpopulations is underprepared students. Each year multiple thousands of students are entering institutions of higher education not prepared to do college-level work. These underprepared students enter college deficient in a college preparatory curriculum; SAT, ACT, and/or ASSET scores; and/or high school grade point average. These underprepared students are not equipped to meet the demands of the college curriculum and are frequently required to participate in developmental education programs in reading, mathematics, and/or English (Ryland et al., 1994). This phenomenon is occurring in community colleges and in some of the nation's most prestigious universities (Cohen and Brawer, 1982). The importance of targeting students low admissions scores was supported by Dey (1990) who reported that admission test scores were positively correlated with retention. Astin (1975) reported that students who require remediation tend to have lower persistence rates than other students and many are expected to fail even before they enter the classroom (Lum, 1985). Colleges also have a stake in retaining students. Students who leave a college before they have accomplished their intended goal represent a tremendous loss of talent and financial support for the institution (Bean, 1986).

Performance

In order for students to obtain their academic goals they must also be successful in their coursework. McTarnaghan (1990) identified the development of academic skills as an important component of academic success for minority students. The single most revealing indicator of a

student's academic success is the student's grade point average (GPA) (Pascarella & Terenzini, 1991). Higher grades are generally considered an indication that a student is more successful in learning in terms of their college experience (Jones & Watson, 1990). Therefore, the most common measurement of a student's academic performance is their cumulative GPA, however, the cumulative number of credits earned may also be used as a performance measurement. Clark and Halpern (1993) surmised that grades (GPA) are a better indicator of cognitive growth for underprepared college students than for other students who may enter college knowing most or all of the material covered in lower division classes.

Remediation

Several studies have examined the impact of remediation for underprepared students. Enrollment in a college developmental studies program provides a positive impact on achievement, attitude, and persistence in underprepared students in various institutions across the United States (Burley, 1993). Completion of a developmental reading course is associated with student persistence in a community college setting (Wochner, 1992), while underprepared students mandatorily placed in at least one remedial course are more likely to be retained than students enrolled in only college-level courses (Strong, 1989). Completion of developmental courses was also found to be positively related to grade point average in university underprepared students (Patty, 1989). For many students a single course of remediation is not enough. Grindstaff (1991) found no difference in the achievement and persistence of underprepared university students who had completed a remedial reading course and those students who had not completed the course.

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Astin's I-E-O Model

Astin (1975) reported that students who require remediation tend to have the highest attrition rate of any students. We applied Astin's (1974, 1985, 1991) input-environment-output (I-E-O) model to an entering cohort of underprepared community college students, in order to determine if early (within first year) intervention increases their persistence and/or performance. This research is significant as it helps identity strategies colleges may use to increase the persistence or performance of underprepared students.

Purpose

The purpose of this longitudinal study was to determine if early remediation affected the persistence and/or performance of underprepared students at one community college. Specific input and environmental characteristics were used to predict the output characteristics of persistence and performance. Literature suggests an affect of remediation in general, but does not specifically address the issue of early remediation, which we define as taking a remedial course(s) within the first year of enrollment. While some studies address mandatory placement, which may assume early remediation, those studies do not address early remediation over remediation in general. We propose the question: to what extent does early remediation have an impact on the persistence and/or performance of underprepared community college students? We attempt to answer this question in two ways: 1) the affect of early remediation on underprepared community college students when compared to prepared students; and 2) the affect of early remediation within the underprepared group of community college students, (i.e. does the affect of early remediation vary with the level of preparedness of the students).

Methods

The data used in this study are from the entering cohort of students at a midwestern, suburban community college in the Fall 1991 and Fall 1992 semesters. All new students are required to take the ASSET basic skills inventory test unless they are eligible for an exemption. Exemptions are granted to students who have earned twenty or more college credits with a minimum 2.0 GPA. The ASSET is a battery of three tests which measure the student's skills in reading, writing, and mathematics. The institution has set a minimum cut-off score for each of the three tests. Students scoring below any one of the cut-off scores are strongly encouraged to enroll, but not mandatorily placed, in a developmental course in the deficient skill area(s).

In the Fall 1991 semester 3,157 students matriculated, and the following fall 3,124 students entered the college. This study focused on the 3,282 students who completed the ASSET test either Fall term. Students who scored above the cut-off on all three tests of the ASSET were defined as prepared for college-level course work. Students scoring below one or more of the cut-off scores were defined as underprepared. The level of preparedness was further defined by the number of test scores the student had below the college determined cut-offs. Students who scored below the cut-off on all three tests were defined as the least prepared for a college-level curriculum.

During the admission process, students are asked to specify their educational intent for attending the college. If the intent is to complete a degree or certificate the student is classified as a degree-seeking student. Students also provide their birth date, ethnicity, and gender on the application for admission. The variables used in the study, including their mean and standard deviation, are detailed for the prepared and underprepared students in Table 1.

Table 1: Comparison of Variables Between Groups

Variables	Prepared Students (n = 2,028) Mean	SD	Underprepared Students (n= 1,254) Mean	SD
Age	22.71	7.22	23.84	8.55
Credits Attempted	23.38	21.96	17.33	20.82
Credits Audited	0.14	0.96	0.13	0.95
Credits Enrolled	27.30	23.62	23.29	23.57
Credits Withdrawn	5.04	7.29	4.38	6.76
Cumulative GPA	2.72	1.02	2.37	1.08
Degree Seeking (Degree = 2)	1.81	0.39	1.72	0.45
Ethnicity (White = 2)	1.80	0.40	1.60	0.49
Gender (Female = 2)	1.51	0.50	1.53	0.50
Number of Terms	4.25	3.02	3.86	3.03

After the raw data were downloaded from the college's mainframe computer, it was initially manipulated/massaged in Microsoft Access and made ready for loading into SPSS (Statistical Package for the Social Sciences). The recoding, crosstabulations, and regression analyses for our study were completed using SPSS for Windows.

Dichotomous Variables

For this study, females were recoded as '2' and males as '1'. The various ethnic categories from the application were coded into '2' for white and '1' for minority/non-white. The degree-seeking intent was recoded into '2' and '1' was used for the non-degree-seeking students.

Other Variables

The age of the student is their age at the time they entered the institution and was calculated by subtracting the student's year of birth from the year the student started at the college.

The number of terms attended is the number of semesters a student has attended the college - including their first semester of enrollment in Fall 1991 or Fall 1992. The number of semesters is not necessarily an indication of sequential semesters. In many cases, students may attend for a semester or two, then 'stop out' for a few semesters and then return and enroll at the college again. Students who began in the Fall 1991 semester could have attended a maximum of fourteen (14) semesters, while students who began in the Fall 1992 semester could have attended a maximum of eleven (11) semesters. Students who graduated from the college were given the maximum number of semesters (11 or 14, depending on their first semester of enrollment) even though they may have actually attended a fewer number of semesters. Since we calculate persistence as the number of terms attended, graduating students were not penalized for finishing their degree and leaving the institution.

The cumulative grade point average (GPA) for the student is the GPA through the Fall 1995 semester - the last semester grades had been posted when the data were pulled from the student data base. The "total credits" data elements represent the total number of credits for which the student was enrolled (enrolled and received a grade at the end of the semester), withdrawn (student was enrolled but withdrew from the class before the end of the semester), and earned (the number of credits the student received a credit earning grade).

Within Group Methods

As mentioned above, the level of preparedness of the underprepared students was defined by the number of test scores the student had below the college defined cut-offs. Table 2 contains the means and standard deviations for the students scoring below one, two, and three of the cut-off scores. The definitions of the variables used for the within group analysis are the same as for the between group (prepared and underprepared) analysis.

Table 2: Comparison of Variables Within Underprepared Groups

	One Score Below (n = 639)		Two Scores Below (n= 443)		Three Scores Below (n= 193)	
Variables	**Mean**	**SD**	**Mean**	**SD**	**Mean**	**SD**
Age	23.21	8.27	23.70	8.63	25.88	8.87
Credits Attempted	19.30	20.92	18.25	22.14	10.47	16.08
Credits Audited	0.11	1.02	0.14	0.90	0.16	0.86
Credits Enrolled	24.21	23.35	25.00	25.11	17.66	20.07
Credits Withdrawn	4.73	6.97	4.69	7.20	2.87	4.88
Cumulative GPA	2.44	1.07	2.34	1.08	2.25	1.09
Degree Seeking (Degree = 2)	1.75	0.43	1.73	0.44	1.63	0.48
Ethnicity (White = 2)	1.69	0.46	1.55	0.50	1.42	0.50
Gender (Female = 2)	1.55	0.50	1.49	0.50	1.55	0.50
Number of Terms	3.97	2.99	4.01	3.15	3.29	2.84

Results

Descriptives - Between Group Comparisons

When comparing descriptive characteristics of academically prepared students and academically underprepared students we found differences in several variables. Typically, underprepared students at our institution had a larger percentage of minority students, attempted fewer credits (attempted credits are accumulated for credit courses other than remedial classes), had a lower GPA, were less likely to indicate a degree-seeking intent, and were slightly older

than their counterparts who were academically prepared (see Table 1). The percentage of female students in both groups was roughly equal. Students in both groups enrolled, on average, for approximately four terms during the course of this study.

Descriptives - Within Group Comparison

We find differences in many descriptive characteristics when comparing students within the underprepared group. The most underprepared students, those students who scored below college recommended ASSET cut-offs on all three tests, are slightly older minorities, who attempt and enroll in fewer classes, have lower GPAs, and are less likely to seek a degree than their other underprepared counterparts. They enroll in 3.29 terms compared to the approximately 4.0 terms of their peer underprepared students. (See Table 2)

Persistence

Predicting Persistence Between Groups

As mentioned earlier, we used the variable "number of terms" as our measure of persistence and employed a multiple regression to determine which factors would best predict persistence. We entered the variables "gender," "ethnicity," "age," and "degree-seeking intent" into the equation as a single block to control for input effects. The environmental variables, "cumulative GPA," "number of remedial courses," and "remedial course(s) first year" were added as a second block. Since only 4.9% of the prepared students took a remedial course we did not use the variables "number of remedial courses" and "remedial course(s) first year" as environmental variables in predicting persistence for those students.

The regression equation shows that "cumulative GPA" and "degree-seeking intent" were significant predictors of persistence for both the prepared and underprepared groups. However for the underprepared group, "number of remedial courses" and "remedial course(s) first year" were also significant predictors (see Table 3). We calculated all significance at the $p < .05$ level. We obtained r-squared values of .18 and .19 for the prepared and underprepared groups, respectively. For prepared students, "degree-seeking intent" (beta = .25) was the largest predictor of persistence. The largest predictor of persistence for the underprepared students was "cumulative GPA" (beta = .35) followed by "number of remedial courses" (beta = .24).

Table 3: Factors Predicting Persistence Between Prepared and Underprepared Students

Prepared Students			**Underprepared Students**		
	Beta	**Sig.**		**Beta**	**Sig.**
Age	-0.05	ns	Age	-0.06	ns
Cumulative GPA	0.20	**	Cumulative GPA	0.35	**
Degree Seeking (Degree = 2)	0.25	**	Degree Seeking (Degree = 2)	0.13	**
Ethnicity (White = 2)	0.21	**	Ethnicity (White = 2)	-0.04	ns
Gender (Female = 2)	-0.09	ns	Gender (Female = 2)	-0.02	ns
			Number of Remedial Courses	0.24	**
			Remedial Course(s) First Year	0.07	**
Multiple R = .43		** $p < .05$	Multiple R = .44		** $p < .05$
R squared = .18			R squared = .19		

Predicting Persistence Within the Underprepared Group

We separated the underprepared group into three categories depending on their scores on the college administered ASSET test. This division created three sub-groups, which are labeled one-, two-, or three-scores below college determined ASSET cut-offs. A regression analysis to predict persistence in these three groups indicates differences within the underprepared cohort. Variables which were significant predictors for persistence in all three groups included

"cumulative GPA," "degree-seeking intent," and "number of remedial courses." However, for those students in the "three scores below" ASSET group "remedial course(s) first year" was also significant. We calculated all significance at the $p < .05$ level. "Cumulative GPA" and "number of remedial courses" were the best predictors for all three groups. The r-squared values for the one, two and three groups below ASSET were .21, .19, and .34, respectively (See Table 4).

Table 4 Factors Predicting Persistence Within Groups of Underprepared Students

One Score Below	Beta	Sig.
Age	-0 03	ns
Cumulative GPA	0 40	**
Degree Seeking (Degree = 2)	0 12	**
Ethnicity (White = 2)	-0 06	ns
Gender (Female = 2)	-0 04	ns
Number of Remedial Courses	0 27	**
Remedial Course(s) First Year	0 04	ns
Multiple R = 46		**p < 05
R squared = 21		

Two Scores Below	Beta	Sig.
Age	-0 15	**
Cumulative GPA	0 36	**
Degree Seeking (Degree = 2)	0 11	**
Ethnicity (White = 2)	0 01	ns
Gender (Female = 2)	0 01	ns
Number of Remedial Courses	0 23	**
Remedial Course(s) First Year	0 06	ns
Multiple R = 43		**p < 05
R squared = 19		

Three Scores Below	Beta	Sig.
Age	0 05	ns
Cumulative GPA	0 32	**
Degree Seeking (Degree = 2)	0 16	**
Ethnicity (White = 2)	-0 13	ns
Gender (Female = 2)	0 02	ns
Number of Remedial Courses	0 37	**
Remedial Course(s) First Year	0 19	**
Multiple R = 58		**p < 05
R squared = 34		

Performance

Predicting Performance Between Groups

The variable "cumulative GPA" was employed as the measure of student academic performance. We entered the variables "age", "degree-seeking intent", "ethnicity", and "gender" into a multiple regression equation as a single block to control for input effects. The environmental variables "number of remedial courses" and "remedial course(s) first year" were added as a second block. These two environmental variables were not used for the prepared students since only 4.9% of these students enrolled in a remedial course.

None of the input variables were significant predictors of performance for the prepared students. For the underprepared cohort, "age", "degree-seeking intent", "ethnicity", and "gender" were all significant predictors of academic performance. The largest predictor of

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performance for the underprepared students was "age" (beta = .21). The r-squared values for both the prepared and underprepared students was .07 (Table 5).

Table 5: Factors Predicting Performance Between Prepared and Underprepared Students

Prepared Students			**Underprepared Students**		
	Beta	**Sig.**		**Beta**	**Sig.**
Age	0.16	ns	Age	0.21	**
Degree Seeking (Degree = 2)	-0.02	ns	Degree Seeking (Degree = 2)	0.08	**
Ethnicity (White = 2)	0.11	ns	Ethnicity (White = 2)	0.08	**
Gender (Female = 2)	0.00	ns	Gender (Female = 2)	0.13	**
			Number of Remedial Courses	-0.05	ns
			Remedial Course(s) First Year	0.05	ns
Multiple R = .26		** p < .05	Multiple R = .27		** p < .05
R squared = .07			R squared = .07		

Predicting Performance Within the Underprepared Group

The variable which was a significant predictor for performance for all three underprepared groups was "age." "Age was also the strongest predictor for all underprepared groups. For those students who scored below the cut-off for one of the ASSET tests, the variables "gender" and "number of remedial courses" were also significant. The variable "number of remedial courses" had a negative beta value (-.16) which indicates the more remedial courses taken the lower the cumulative GPA. For students with two scores below ASSET cut-offs, "remedial course(s) first year" was also a positive predictor. For the most underprepared students, "ethnicity" was also a predictor of academic performance.

Table 6 Factors Predicting Performance Within Groups of Underprepared Students

One Score Below			**Two Scores Below**			**Three Scores Below**		
	Beta	**Sig.**		**Beta**	**Sig.**		**Beta**	**Sig.**
Age	0.23	**	Age	0.20	**	Age	0.23	**
Degree Seeking (Degree = 2)	0.08	ns	Degree Seeking (Degree = 2)	0.03	ns	Degree Seeking (Degree = 2)	0.11	ns
Ethnicity (White = 2)	0.01	ns	Ethnicity (White = 2)	0.05	ns	Ethnicity (White = 2)	0.23	**
Gender (Female = 2)	0.14	**	Gender (Female = 2)	0.09	ns	Gender (Female = 2)	0.16	ns
Number of Remedial Courses	-0.16	**	Number of Remedial Courses	-0.02	ns	Number of Remedial Courses	0.02	ns
Remedial Course(s) First Year	0.01	ns	Remedial Course(s) First Year	0.15	**	Remedial Course(s) First Year	-0.07	ns
Multiple R = .32		**p < .05	Multiple R = .28		**p < .05	Multiple R = .37		**p < .05
R squared = .10			R squared = .08			R squared = .13		

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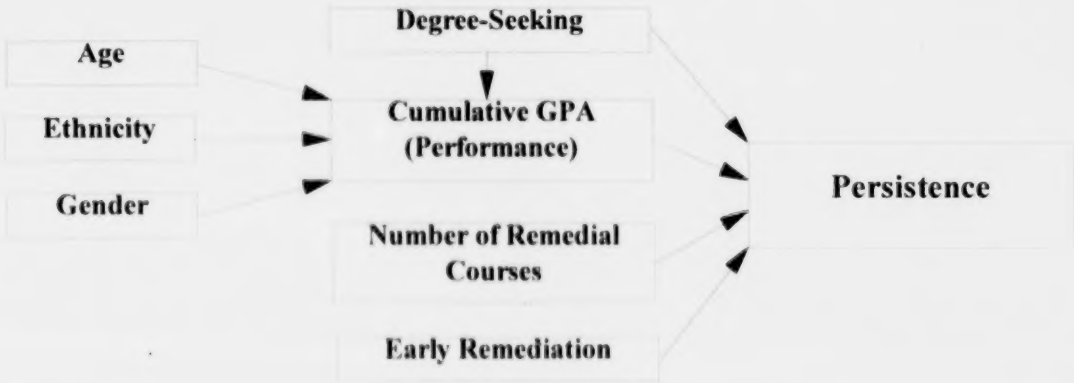
Discussion

Our findings concur with other studies of persistence (Tinto, 1975; Astin, 1984; Bean and Metzner, 1985) and remediation (Burley, 1993; Wochner, 1992; and Strong, 1989) in that we find the variables "cumulative GPA" and "number of remedial courses" impacted underprepared community college student persistence. However, our findings further suggest that early remediation, taking a remedial class within the first year, and a degree-seeking intent are also significant predictors of persistence, particularly for those students who are the most underprepared for a college level curriculum. Using Astin's I-E-O model we found both input and environmental characteristics that predicted the output variable of persistence.

While "cumulative GPA", "number of remedial courses", "remedial course(s) first year", and "degree-seeking intent" were significant predictors of persistence, the variables "age", "ethnicity", "gender", "degree-seeking intent" were significant predictors of the academic performance (cumulative GPA) for underprepared community college students. Figure 1 models the relationship of persistence, academic performance, and the input and environmental variables used in the study. For underprepared community college students, age, ethnicity, and gender predict academic performance which in turn is a predictor of persistence. Our model explains 19% of the variance for predicting persistence of underprepared community college students.

Figure 1. Model of Underprepared Student Persistence in a Community College



When looking at the three groups of underprepared students, we find the environmental variables "number of remedial courses" and "cumulative GPA" and the input variable "degree-seeking intent" predicted persistence for all groups. We find the environmental variable "taking a remedial course first term" is a significant predictor for only the least prepared students. Our model explains approximately 20% of the variance for the first two groups of underprepared students, but 34% of the variance for the least prepared students. Therefore, we concur with other researchers (Burley, 1993; Wochner, 1992; Strong, 1989) that remedial courses increase persistence and in addition, suggest that when underprepared students take remedial courses their persistence increases. However, in addition, we suggest that for those students who are the least prepared for college-level course work, taking a remedial course their first year increases persistence rates.

We have struggled with the high correlation between "the number of remedial classes taken" and "number of terms enrolled." Those underprepared students who are the least prepared

for college-level course work (three scores below college cut-offs), tend to take high numbers of remedial classes and do not take as many college-level courses (see Table 2 - credits attempted mean, 10.47) compared to their underprepared peers (credits attempted means, 19.30 and 18.25). This indicates that the least prepared students spend the majority of their enrollment in remedial courses. We do feel that these students are making progress, but at a much slower pace. Comparing performance across the three groups of underprepared students shows the least prepared students do have a lower cumulative GPA then their counterparts, however, their cumulative GPA is above a 'C' average (2.25).

Limitations

Our model is limited in that data on certain variables known to be predictors of persistence in other studies (Tinto, 1975; Astin, 1984; Bean and Metzner, 1985; Pascarella and Terenzini, 1991) are not available. These variables include: high school GPA, parental education, socio-economic status, and social integration variables. In respect to underprepared students, we believe the variable "remedial course(s) first term" would still be a predicting variable, particularly with the most underprepared students. We base that opinion on the predictive strength (beta = .19) of "remedial course(s) first term" in the regression for the most underprepared students. We feel that the high correlation between high school GPA and college GPA (Tinto, 1975; Astin, 1984) and the less predictive values of social integration variables for community college students (Bean and Metzner, 1985) would not weaken the predictive value of our model. In the future, when our institution's data collection abilities improve, we hope to integrate those variables into our model.

Summary

We conducted a longitudinal study at a midwestern community college which compared factors predicting persistence and performance of underprepared students. We employed Astin's I-E-O model to determine which input and environmental factors affected persistence and performance. Our findings are consistent with other persistence models, which show initial student intent to obtain a degree and high cumulative GPA as predictors of persistence. Our results indicate that the number of remedial courses that an underprepared student completes, as well as taking the remedial course during the first year, are predictors for persisting at the college. The student's degree-seeking intent, age, ethnicity, and gender are predictors of their academic performance which in turn is a predictor of persistence.

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